

WHAT IS CLAIMED IS:

1. An X-ray projection exposure apparatus, comprising:
a mask chuck for holding a reflection X-ray mask having a mask pattern thereon;
a wafer chuck for holding a wafer onto which the mask pattern is transferred;
an X-ray illuminating system for illuminating the reflection X-ray mask, held by said mask chuck, with X-rays;
and
an X-ray projection optical system for projecting the mask pattern of the reflection X-ray mask onto the wafer held by said wafer chuck with a predetermined magnification,
wherein said mask chuck comprises a mechanism for generating static electricity for attracting and holding the reflection X-ray mask by an electrostatic force.
2. An apparatus according to Claim 1, further comprising a detection mechanism for detecting an attracting force when attracting and holding the reflection X-ray mask on said mask chuck.
3. An apparatus according to Claim 2, wherein said detection mechanism comprises a pressure sensor provided on an attracting surface of said mask chuck.

4. An apparatus according to Claim 1, further comprising means for performing scanning exposure by moving both of said mask chuck and said wafer chuck.

5. An apparatus according to Claim 1, wherein said mask chuck holds the mask against gravity.

6. An apparatus according to Claim 1, further comprising means for changing the electrostatic force for attracting the reflection X-ray mask by said mask chuck in accordance with the movement of said mask chuck.

7. An apparatus according to Claim 6, wherein the relationship of $\{(\text{the mass of the reflection X-ray mask}) \times (\text{acceleration due to gravity} + \text{the maximum acceleration of the reflection X-ray mask while being moved}) / (\text{the maximum coefficient of static friction between the reflection X-ray mask and said mask chuck})\} \times (\text{safety factor}) < (\text{the attracting force of the reflection X-ray mask})$ is satisfied.

8. An apparatus according to Claim 1, wherein said mask chuck comprises a mask holding surface and a plurality of projections formed on said mask holding surface, and wherein the reflection X-ray mask is supported by said plurality of

projections.

9. An apparatus according to Claim 8, wherein the ratio of the area of contact portions where the distal ends of said plurality of projections and the mask to the entire area of the mask is equal to or less than 10 %.

10. An apparatus according to Claim 8, wherein a plurality of voids are formed between said plurality of projections, said apparatus further comprising means for supplying the plurality of voids with a cooling gas when the reflection X-ray mask is supported on said plurality of projections.

11. An apparatus according to Claim 1, further comprising a temperature control mechanism for controlling the temperature of said mask chuck.

12. An apparatus according to Claim 11, wherein said temperature control mechanism comprises means for supplying the inside of said mask chuck with a temperature control medium, and a temperature sensor for detecting the temperature of said mask chuck.

13. An apparatus according to Claim 1, wherein said

mask chuck comprises a ceramic material or a glass material.

14. An apparatus according to Claim 1, further comprising a grounded earth pawl provided at at least a side of said mask chuck for supporting the mask.

15. An apparatus according to Claim 1, wherein the reflection X-ray mask comprises an X-ray reflecting multilayer film and wherein the mask pattern is made of an absorbing member formed on the X-ray reflecting multilayer film.

16. An apparatus according to Claim 1, wherein said X-ray illuminating system comprises a radiation source and a reflecting mirror.

17. An apparatus according to Claim 1, wherein said X-ray projection optical system comprises a reduction projection optical system having a plurality of X-ray reflecting mirrors.

18. A device manufacturing method using an X-ray projection exposure apparatus comprising a mask chuck for holding a reflection X-ray mask having a mask pattern thereon, a wafer chuck for holding a wafer onto which the

mask pattern is transferred, an X-ray illuminating system for illuminating the reflection X-ray mask, held by the mask chuck, with X-rays, and an X-ray projection optical system for projecting the mask pattern of the reflection X-ray mask onto the wafer held by the wafer chuck with a predetermined magnification, the mask chuck comprising a mechanism for generating static electricity for attracting and holding the reflection X-ray mask by an electrostatic force, said method comprising the step of:

generating static electricity with the mechanism of the mask chuck to hold the reflection X-ray mask with the mask chuck by an electrostatic force;

holding the wafer with the wafer chuck;

illuminating the reflection X-ray mask with X-rays using the X-ray illuminating system; and

projecting the mask pattern of the reflection X-ray mask onto the wafer held by the wafer chuck with a predetermined magnification with the X-ray projection optical system to transfer the mask pattern onto the wafer.